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## PORTABLE VACUUM CLEANING DEVICE

### BACKGROUND

Field: This invention relates to devices for cleaning submerged structural surfaces of water bodies such as the bottoms of swimming pools, spas and the like, and particularly concerns unique structure of a water jet operative vacuum type cleaner for removing and filtering out leaves and other such debris from said structural surfaces.

Prior Art: A device of this general type is described in U.S. Patent 6,502,269B1 the disclosure of which is hereby incorporated herein by reference in its entirety. A major problem with the cleaner of this patent is that the water-debris intake of the cleaner is in direct fluid communication with intake of the jet pump. In situations where the pool debris contains organic material such as leaves or small pieces of sticks or the like, the pump intake filter will rapidly clog and render the cleaner inoperative.

Principal objects therefore of the invention are: to provide a water jet vacuum type, pool cleaning device which is easy to use and maintain and which preferably utilizes a battery operated water jet pump which, in normal use, virtually cannot be clogged with pool debris; and to provide such device in a structurally simple design and at an economical cost.

### Summary Of The Invention

A water jet vacuum cleaning device for vacuuming debris from underwater structural surfaces, said device comprising a suction cavity having a debris-water inlet adapted to be moved with said device along said surfaces in proximity thereto, and further having a debris-water outlet surrounded by a filter bag exterior to said cavity for entrapping debris, a water ejector tube mounted in said cavity in line with said outlet and adapted for connection exteriorly of said cavity to a source of high pressure water, said tube further having a water discharge end located within said cavity and spaced from said outlet to provide a debris entry gap communicating with said outlet, and wherein the flow area of said outlet is at least about twice the flow area of said tube, whereby when water is ejected from said discharge end across said gap and thru said outlet the pressure within said cavity will be reduced sufficiently to suck water-debris from said surfaces and thru said outlet and into said bag.

### Brief Description Of The Drawings

The invention and its objects will become further apparent from the drawings herein wherein the various figures are not drawn to scale or proportion and are intended to facilitate understanding of the invention, and wherein:

FIG. 1 is a side view of the present device in operating position adjacent a pool bottom surface with portions of the housing broken away for clarity;

FIG. 2 is a top view of the present device without the filter bag and taken along line 2-2 in Fig. 1 with portions of the housing broken away for clarity;

FIG. 3 is a cross-sectional view taken along line 3-3 in Fig. 2;

FIG. 4 is a cross-sectional view taken along line 4-4 in Fig. 3 and showing flow area as double cross hatched;

FIG. 5 is a cross-sectional view taken along line 5-5 of Fig. 3 and showing flow area as double cross hatched

#### Detailed Description

Referring to the drawings and with particular reference to the claims herein, the present water jet cleaning device 10 for underwater vacuuming of debris 11 from structural surfaces such as bottom 12 of swimming pools or other water bodies comprises a substantially closed housing 14 formed by wall means generally designated 16 preferably of structural plastics such as PVC, cellulose, butyrates, polyamides, polyolefin or the like, or metal or ceramic, and providing a suction cavity 18. This cavity can be of any operator convenient volumetric capacity and configuration, however the configuration shown in the drawings is preferred with a capacity of from about 800 to about 1,800 ml., most preferably from about 1,000 to about 1,500 ml.

A debris-water suction inlet 20 extends thru said wall means into said cavity. This inlet is of a typical elongated generally rectangular configuration of, for example, a flow area of about 10 in<sup>2</sup> to about 16 in<sup>2</sup> for a cavity capacity of from about 1,000 to about 1,500 ml. The height of the inlet rim 22 from the surface 12 should be from about ¼ to about ½ inch for best results and is maintained, e.g., by a pair of wheels 24 mounted on the housing sides adjacent the inlet.

A debris-water discharge conduit 26 formed by said wall means has an exit end 28 surrounded by a filter bag 30 exterior to said housing and of any desired capacity for entrapping said debris. The filter bag inlet end is affixed in groove 31 encircling an enlarged filter bag attachment collet 33 into which a removable retaining snap ring or band 35 is secured. This collet is threaded into rim 37 provided by wall means 16. Conduit 26 has an entry end portion 32 opening into said cavity, and further has a flow axis 34. End portion 32 is depicted in Fig. 3 as a dotted line 36 marking the terminus of the funnel shaped portions 38 of wall 16. In this regard it also marks the outlet end of suction cavity 18.

A fluid ejector tube 40 is mounted in cavity 18 and extends thru wall means 16 and has a flow axis 42, a fluid inlet 44 on a distal end portion thereof which is adapted for connection exteriorly of said cavity to a source 46 of high pressure fluid. This tube further has a fluid ejector end or nozzle 48 located within said cavity and spaced from said entry end 32 of said conduit and thus provides a debris entry gap 50 communicating with said entry end. The tube flow axis and the conduit flow axis are in substantial alignment for maximizing the suction and transport effect of stream 52 indicated as dotted arrow lines.

The flow area 54 of the exit end 28 of said conduit is at least about twice the flow area 55 of the ejector end 48 of said tube, whereby when fluid stream 52 is ejected from said ejector end and across said gap 50 and thru said discharge conduit 26 and into said filter bag 30 the pressure within said cavity 18 will be reduced sufficiently to suck water-debris from said surfaces up to and into said stream for transport into said filter bag container without the inlet 45 of said high pressure source 46 or the inlet 44 of said tube being

exposed to said debris. It is noted that the present construction affords a practically obstructionless passageway from inlet 20 to exit 28 for the debris.

The various parts or portions such as wall means 16, tube 40, conduit 26, the housing 56 of electric battery operated water pump 46, the attachment collet 33 for the fine mesh filter bag 30, and the operators handle section 62 may be formed as a monolithic structure by plastic injection molding or the like, or may be individually provided and plastic welded or ~~adhesively assembled~~ together to form the device.

Handle 62 shown in Fig. 1 preferably carries the electrical leads 64 which extends upwardly thru handle extension 66 to a battery in the manner shown for example by the aforesaid patent 6,502,269 B1, particularly items 12 and 13 described in column 5 thereof.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications will be effected with the spirit and scope of the invention.